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POPOSAURUS GRACILIS, A NEW REPTILE FROM THE TRIASSIC OF WYOMING

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Some time ago the writer mentioned a new form from the Triassic of Wyoming and briefly described one of the vertebra.¹ At that time it was hoped that the explorations in the western Trias of the past season would bring to light something further concerning this peculiar form. No additional evidence has so far been disclosed, however, in the collections from Arizona and New Mexico, and it is probably well at this time to describe more fully the remains for the benefit of others who may be engaged in the same field.

The material herein described consists of an ilium, several vertebrae from various parts of the column, two femora, a tibia, the proximal end of a fibula, and several innominate fragments. All are considerably crushed and broken. The leg bones are so flattened that it is rather difficult to determine the true proportions.

The ilium, as previously pointed out,² is very similar to that described by J. H. Lees³ as belonging to *Paleorhinus Bransoni*. The condition of the bone suggests little distortion; still, upon a comparison with the specimen described by Lees, it is evident that the supra-acetabular flange has been somewhat depressed by pressure. To all appearances the acetabulum is formed almost entirely by the ilium. It is broad and deep and closely confined above by the supra-acetabular flange. In preparing the specimen what appears to be a foramen of perhaps 5 mm. in diameter was exposed, running in and slightly upward from the upper acetabular surface. It is barely possible, however, that this is simply a matrix-

¹ M. G. Mehl, "The Phytosauria of the Rocky Mountain Trias," *Jour. Geol.*, 1914 (in press).

² *Op. cit.*, p. 159.

³ "The Skull of *Paleorhinus*, a Wyoming Phytosaur," *Jour. Geol.*, XV (1905), 44.

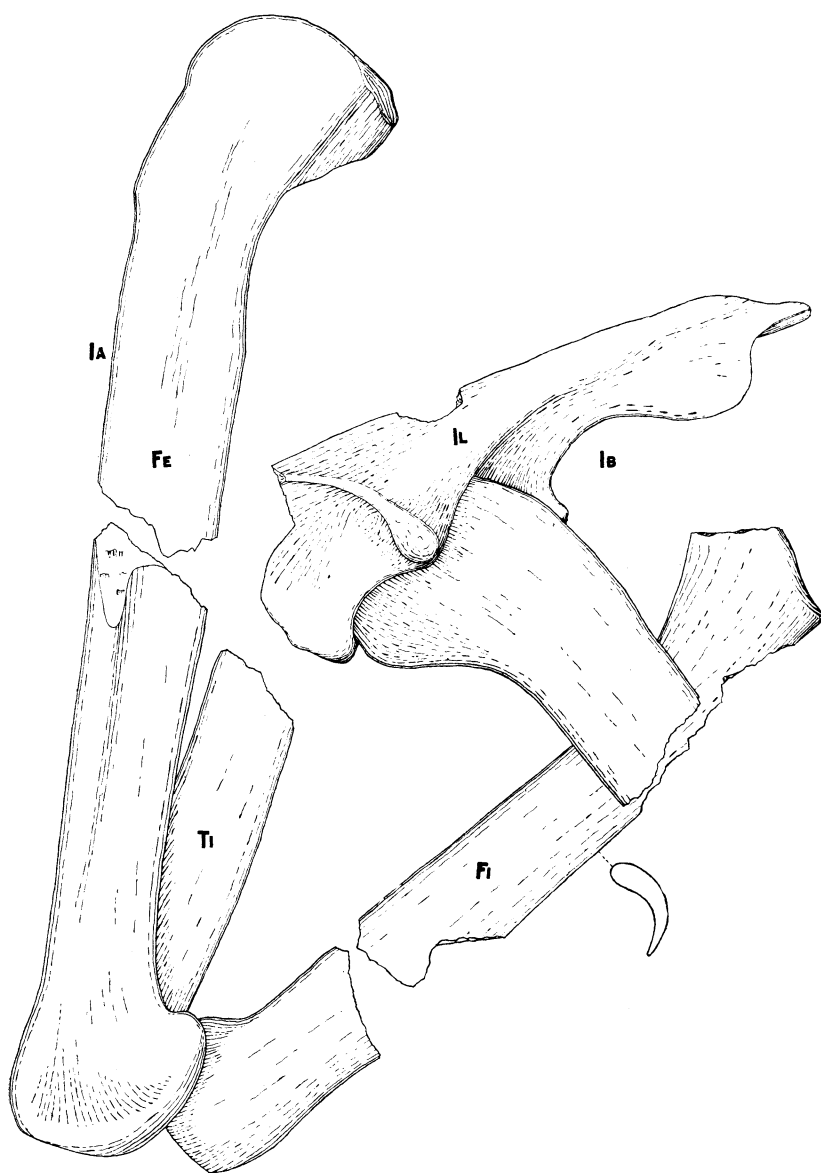


FIG. 1.—*Poposaurus gracilis*. 1a, left femur, tibia, and fibula as they lay in the matrix. 1b, right ilium and femur. All about $\frac{1}{3}$ natural size.

filled crack. From the center of the margin of the supra-acetabular flange a strong ridge runs up and back in a regular curve. Below, this ridge is about 20 mm. in width from which it gradually narrows till it becomes confluent with the upper posterior margin of the ilium. The upper posterior process is broken away, but the indications are that it was a thin, platelike process with rounded border, separated from the lower posterior process by a deep sinus. The upper anterior process is irregular in shape, extending forward in a regularly expanding spatulate form. A marked ridge extends along its outer surface from the supra-acetabular flange, becoming fainter anteriorly and finally confluent with the upper anterior border. The process makes up nearly half of the total length of the ilium, the greatest length of which is 250 mm. The lower anterior projection of the ilium has a somewhat antero-posterior elongated, convex face for the articulation of the pubis. The articular face for the ischium, the lower posterior process, is somewhat larger, triangular in outline and nearly flat. These two articular faces are separated by the thin, apparently complete lower border of the acetabulum, strongly suggesting a perforate acetabulum, as in the dinosaurs.

Of the dorsal vertebrae but two are sufficiently well preserved to be of use in description. They probably represent the anterior thoracics inasmuch as they show an early stage in the transition of capitular facet from the anterior face of the centrum to the neural arch. The description of one of these will suffice as they show essentially the same features.

The centrum is spool-shaped, moderately biconcave, and very much constricted laterally between the articular faces. This has probably been greatly accentuated by pressure. The articular faces are oval in outline, about 32 mm. wide and 39 mm. high. The centrum is 54 mm. long and was probably 15 mm. wide at the center in an uncrushed condition. The neural arch is high and delicately constructed. The diapophysis is a thin horizontal plate confluent anteriorly with the articular face of the zygapophysis and gradually expanding posteriorly. At its posterior extremity it suddenly thickens below for the tubercular facet which is separated from the posterior zygapophysis by a deep, rounded sinus.

At this point, the greatest width of the diapophyses, the two tubercular facets are approximately 50 mm. apart. Near the mid-length the diapophysis is supported below by two thin diverging buttresses, the anterior one confluent below with the upper anterior

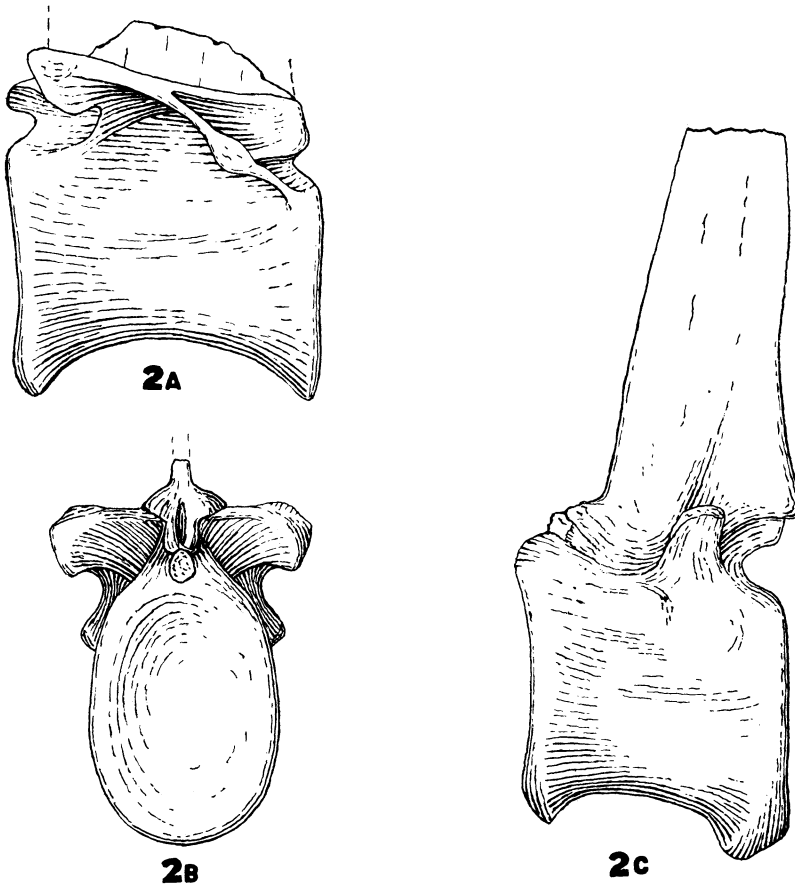


FIG. 2.—*Poposaurus gracilis*. 2a, right lateral view of one of the dorsal vertebrae. 2b, posterior view of the same. 2c, left lateral view of second caudal vertebra. All about $\frac{2}{3}$ natural size.

face of the centrum. Just before reaching this point it is considerably swollen to form the capitular facet for the reception of the rib. The posterior support is directed toward the upper posterior face of the centrum, but loses its identity before reaching that

point. The distance between the capitular and tubercular facets is about 38 mm. The articular faces of the zygapophyses are of moderate size. The anterior pair are directed up and in; the posterior pair, of necessity, out and down. The anterior pair form a cuplike depression with a narrow antero-posteriorly directed median sinus into which apparently extended a thin vertical support of the posterior pair of zygapophyses of the preceding vertebrae, a condition that would apparently restrict somewhat the free motion of the vertebral column. But little remains of the spine. At the base it is 5 mm. thick and about 45 mm. wide.

The sacrum consists of at least four, and probably five closely united vertebrae with a total length of perhaps 230 to 290 mm. It is considerably abraded and lacks most of the neural arch. The centra of the component vertebrae rapidly decrease in size posteriorly. The anterior face of the first is about 45 mm. in diameter. All the centra are considerably constricted laterally. Apparently only the anterior two vertebrae bear sacral ribs, though this is not certain. The ribs were stout, somewhat flattened, and articulated low on the neural arch near the mid-length of the vertebra.

The caudal vertebrae are represented by the first and second of the series. The second is nearly perfect and will serve well to characterize the group. The centrum is 50 mm. long, somewhat more deeply biconcave than the dorsals, and much constricted laterally at mid-length. The articular faces are some 40 mm. wide and 50 mm. high. Below there is a strong inter-centrum articulation for the reception of chevron bones. These articulations are well developed on both the anterior and posterior faces, but considerably stronger on the anterior face of the vertebra. The diapophyses are placed high on the neural arch and well back. Their tips are slightly higher than the neural canal. They are short, directed upward, and slightly back. From tip to tip they measure 42 mm. The zygapophyses are placed close together, the anterior ones directed in and upward. The spine is long and thin and directed very slightly backward. At the base it is about 5 mm. thick and 35 mm. wide. The extremity is broken away, probably no considerable portion, leaving the total height of the vertebra 135 mm.

The first caudal differs from the second in that the centrum of the former is somewhat longer, has larger articular faces, and has the chevron articulation at the posterior end only. There is also a considerable difference in the diapophyses of the two vertebrae. In the first they are broad and, although badly weathered, suggest a lateral face of perhaps 30 mm. anterior-posterior extent as compared with 10 mm. in the second. In the first caudal the diapophyses are placed farther forward and slightly lower than in the second and are slightly supported by the centrum.

The condition of the leg bones is such that little can be done in the way of description other than stating approximate measurements. The femur is at least 465 mm. long and very slender. In an uncrushed condition the shaft was probably about 45 mm. in diameter. The head is considerably expanded antero-posteriorly, measuring 85 mm. in that direction. Little can be said of the condyles except that the antero-posterior extent of the articular face was great, perhaps 85 mm. or more.

A piece of the tibia, 125 mm. in length, a portion of the shaft near the proximal end, remains imbedded in the matrix in its natural relation with the left femur. In life the shaft was probably about 30 mm. in diameter. The left fibula, some 345 mm. in length, is very thin laterally and much expanded antero-posteriorly at both the proximal and distal ends. The shaft, which is 40 mm. in width, is regularly concavo-convex antero-posteriorly throughout its entire length, the convexity outward. Were this a feature due to distortion only, one would hardly expect the solid articular ends to conform to the curvature of the thin shaft as they do. Furthermore, polished cross-sections of the shaft do not suggest considerable flattening of its walls.

RELATIONSHIPS

The specimen has little in common with the phytosaurs; besides its apparently perforate acetabulum, of which there is but the slightest suggestion in some of the phytosaurs, it shows a marked difference in the shape of the ilium and in the comparatively large number of vertebrae fused together in the sacrum. In the phytosaurs there are but two sacrals and these are free. As *Dolichobrachium*, described by Dr. S. W. Williston from the Trias of

Wyoming,¹ is known from the humerus, teeth, and coraco-scapula only, there is little basis for comparison. The first two elements and especially the coraco-scapula are suggestive of a more massive build than that of the present specimen. There is, however, the possibility that these two forms are identical, an uncertainty that must remain till more abundant material is to be had. In some respects it resembles some of the early dinosaurs. The hollow, slender leg bones, the slightly biconcave vertebrae, are suggestive of the Theropoda and the perforate acetabulum is typically dinosaurian. Unlike the condition in this group of dinosaurs, however, each sacral rib is supported by a single vertebra. While this is a condition found in the sauropod dinosaurs, their solid bones, the expanded neural canal of the sacrum, and many minor points are very different from the form under discussion. In the future it may be shown that the genus *Palaeoctonus* of Cope is related to the form here described as, indeed, there is a possibility that *Palaeoctonus* and *Dolichobrachium* are identical. When the remains of the latter genus were discovered there were present portions of a skull in a powdery condition, too poorly preserved to be saved. According to Dr. Williston there was enough seen of the teeth, however, to suggest a possible relationship with *Palaeoctonus*.

Everything in the structure of the form so far studied indicates a well-muscled creature light in weight, possibly bipedal in gait occasionally, and most assuredly swift in movement. The name *Poposaurus gracilis* is suggested for the material herein described from its discovery on the Popo Agie river.

The type specimen is numbered 602 in the University of Chicago collections. It was collected by Professor E. B. Branson in the red beds near Lander, Wyoming.

¹ "Notice of Some New Reptiles from the Upper Trias of Wyoming," *Jour. Geol.*, XII (1904), 688.